LISTING OF CLAIMS:

Claim 1 (original): A radio equipment changing antenna directivity on real time basis and transmitting/receiving signals time divisionally to/from a plurality of terminals, comprising:

a plurality of antennas arranged in a discrete manner; and

a transmission circuit and a reception circuit sharing said plurality of antennas for transmitting/receiving signals; wherein

said reception circuit includes

a reception signal separating unit for separating a signal from a specific terminal among said plurality of terminals, based on signals from said plurality of antennas, when a reception signals is received, and

a reception transmission path estimating unit estimating a reception response vector of a propagation path from said specific terminal, based on signals from said plurality of antennas, when said reception signal is received;

said transmission circuit includes

transmission propagation path estimating unit estimating a transmission response vector of a transmission path when a transmission signal is transmitted, based on a result of estimation by said reception propagation path estimating unit, and

a transmission directivity control unit updating said antenna directivity when said

transmission signal is transmitted, based on a result of estimation by said transmission propagation path estimating unit; and

said transmission propagation path estimating unit includes

an extrapolation processing unit calculating said transmission response vector of a down link slot to said specific terminal, by an extrapolation process based on a plurality of said reception response vectors of up link slots from said specific terminal estimated by said reception propagation path estimating unit,

a memory holding a plurality of parameters used for said extrapolation process, determined in advance in accordance with the propagation environment of said propagation path, and

a selecting unit estimating the propagation environment of said propagation path, selecting a parameter corresponding to said estimated propagation environment among said held plurality of parameters, and applying the selected parameter to extrapolation process by said extrapolation processing unit.

Claim 2 (original): The radio equipment according to claim 1, wherein

said parameter is an extrapolation distance in the extrapolation process by said extrapolation processing unit, said memory holds a plurality of extrapolation distances determined in advance in accordance with Doppler frequencies representing said propagation environment, and said selecting unit estimates Doppler frequency of said propagation path,

selects the extrapolation distance corresponding to said estimated Doppler frequency among said held plurality of extrapolation distances and applies the selected extrapolation distance to the extrapolation process by said extrapolation processing unit.

Claim 3 (original): The radio equipment according to claim 2, wherein

said selecting unit selects a shorter extrapolation distance when the estimated Doppler frequency is lower, and selects a longer extrapolation distance when the estimated Doppler frequency is higher.

Claim 4 (original): The radio equipment according to claim 1, wherein

said parameter is an extrapolation distance in an extrapolation process by said extrapolation processing unit, said memory holds a plurality of extrapolation distances determined in advance in accordance with a signal error between said separated signal and an expected desired signal, which represents said propagation environment and

said selecting unit estimates signal error of said propagation path, selects the extrapolation distance corresponding to said estimated signal error among said held plurality of extrapolation distances and applies the selected extrapolation distance to the extrapolation process by said extrapolation processing unit.

Claim 5 (original): The radio equipment according to claim 4, wherein said selecting unit selects a shorter extrapolation distance when the estimated signal error is larger, and selects a larger extrapolation distance when the estimated signal error is smaller.

Claim 6 (original): The radio equipment according to claim 1, wherein said parameter is an extrapolation distance in an extrapolation process by said extrapolation processing unit, said memory holds a plurality of extrapolation distances determined in advance in accordance with Doppler frequencies and a signal error between said separated signal and an expected desired signal, which represent said propagation environment, and said selecting unit estimates the Doppler frequency and the signal error of said propagation path, selects an extrapolation distance corresponding to said estimated Doppler frequency and the signal error among said held plurality of extrapolation distances and applies the selected extrapolation distance to the extrapolation process by said extrapolation processing unit.

Claim 7 (original): The radio equipment according to claim 6, wherein said selecting unit temporarily selects an extrapolation distance corresponding to said estimated Doppler frequency, and corrects said temporarily selected extrapolation distance in accordance with said estimated signal error.

Claim 8 (original): The radio equipment according to claim 1, wherein the relation between said propagation environment and said plurality of parameters is determined individually for every said radio equipment.

Claim 9 (original): The radio equipment according to claim 1, wherein the relation between said propagation environment and said plurality of parameters is determined commonly to a plurality of said radio equipments.

Claim 10 (original): In a radio equipment changing antenna directivity on real time basis and transmitting/receiving signals time divisionally to/from with a plurality of terminals, a Doppler frequency estimating circuit estimating Doppler frequency of a propagation path with a specific terminal, comprising:

a reception signal separating unit separating a signal from said specific terminal among said plurality of terminals based on signals received by a plurality of antennas arranged in a discrete manner;

a reception propagation path estimating unit estimating a reception response vector of a propagation path from said specific terminal, based on signals received by said plurality of antennas;

a correlation operating unit calculating a vector correlation value based on reception response vectors preceding and succeeding in time estimated by said reception propagation path

estimating unit; and

an estimating unit estimating a Doppler frequency corresponding to the vector correlation value calculated by said correlation operating unit, based on correspondence between vector correlation values and Doppler frequencies determined in advance experimentally.

Claim 11 (original): The Doppler frequency estimating circuit according to claim 10, wherein

said correlation operating unit includes a calculating unit calculating an instantaneous correlation value between said reception response vectors preceding and succeeding in time and outputting calculated value as said vector correlation value.

Claim 12 (original): The Doppler frequency estimating circuit according to claim 10, wherein

said correlation operating unit includes

a calculating unit calculating an instantaneous correlation value between said reception response vectors preceding and succeeding in time, and

an averaging unit weight-averaging a past correlation value and a present correlation value calculated by said calculating unit with a prescribed weight coefficient, and outputting an obtained average value as said vector correlation value

Claim 13 (original): The Doppler frequency estimating circuit according to claim 12, wherein

said prescribed weight coefficient is set such that a weight for a past correlation value is large and a weight for a present correlation value is small.

Claim 14 (original): The Doppler frequency estimating circuit according to claim 10, wherein

said correlation operating unit calculates a vector correlation value based on a reception response vector of a present frame slot and a reception response vector of an immediately preceding frame slot.

Claim 15 (original): The Doppler frequency estimating circuit according to claim 10, wherein

said correlation operating unit calculates a vector correlation value based on a reception response vector of a present frame slot, and a reception response vector of a most recent slot free of any reception error among past frame slots.

Claim 16 (original): The Doppler frequency estimating circuit according to claim 10, wherein

said correlation operating unit calculates a vector correlation value based on a reception response vector of a former half and a reception response vector of a latter half of one slot.

Claim 17 (original): A radio equipment changing antenna directivity on real time basis and transmitting/receiving signals time divisionally to/from a plurality of terminals, comprising:

a plurality of antennas arranged in a discrete manner; and

a transmission circuit and a reception circuit sharing said plurality of antennas for transmitting/receiving signals; wherein

said reception circuit includes

a reception signal separating unit separating a signal from a specific terminal among said plurality of terminals, based on signals from said plurality of antennas, when a reception signal is received, and

a reception propagation path estimating unit estimating a reception response vector of a propagation path from said specific terminal based on signals from said plurality of antennas, when said reception signal is received;

said transmission circuit includes

a transmission propagation path estimating unit estimating a transmission response vector of a propagation path when a transmission signal is transmitted, based on a result of estimation by

said reception propagation path estimating unit, and

a transmission directivity control unit updating said antenna directivity when said transmission signal is transmitted, based on a result of estimation by said transmission propagation path estimating unit;

said transmission propagation path estimating unit includes

an extrapolation processing unit calculating said transmission response vector of a down link slot to said specific terminal, by an extrapolation process based on a plurality of said reception response vectors of up link slots of said specific terminal estimated by said reception propagation path estimating unit,

a Doppler frequency estimating unit estimating a Doppler frequency of said propagation path,

a memory holding a plurality of parameters used for said extrapolation process, determined in advance in accordance with the Doppler frequencies of said propagation path, and

a selecting unit selecting a parameter corresponding to said estimated Doppler frequency among said held plurality of parameters and applying the selected parameter to the extrapolation process by said extrapolation processing unit; and

said Doppler frequency estimating unit includes

a correlation operating unit calculating a vector correlation value based on reception response vectors preceding and succeeding in time estimated by said reception propagation path estimating unit, and

an estimating unit estimating a Doppler frequency corresponding to the vector correlation value calculated by said correlation operating unit, based on correspondence between vector correlation values and Doppler frequencies determined in advance experimentally.

Claim 18 (original): The radio equipment according to claim 17, wherein

said correlation operating unit includes a calculating unit calculating an instantaneous correlation value between said reception response vectors preceding and succeeding in time and outputting the calculated value as said vector correlation value.

Claim 19 (original): The radio equipment according to claim 17, wherein

said correlation operating unit includes

a calculating unit calculating an instantaneous correlation value between said reception response vectors preceding and succeeding in time, and

an averaging unit weight-averaging a past correlation value and a present correlation value calculated by said calculating unit with a prescribed weight coefficient, and outputting an obtained average value as said vector correlation value.

Claim 20 (original): The radio equipment according to claim 19, wherein

said prescribed weight coefficient is set such that a weight for a past correlation value is large and a weight for a present correlation value is small.

Claim 21 (original): The radio equipment according to claim 17, wherein said correlation operating unit calculates a vector correlation value based on a reception response vector of a present frame slot and a reception response vector of an immediately preceding frame slot.

Claim 22 (original): The radio equipment according to claim, 17, wherein said correlation operating unit calculates a vector correlation value based on a reception response vector of a present frame slot and a reception response vector of a most recent slot free of any reception error among past frame slots.

Claim 23 (original): The radio equipment according to claim 17, wherein said correlation operating unit calculates a vector correlation value based on a reception response vector of a former half and a reception response vector of a latter half of one slot.

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